



PIER Energy System Integration Program Area

Modeling Interconnection Analysis & Planning

Contract #: 500-03-011 **Project #:** 5

Contractor: National Renewable Energy Laboratory (NREL)

Subcontractors: Northern Power Systems

Project Amount: \$405,897

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Status: Active

Project Description:

The purpose of this project is two fold. The first goal is to validate and leverage the work by Northern Power Systems to develop a universal interconnection device. National Renewable Energy Laboratory (NREL) will model their device with computers and evaluate its performance when interconnected to a simulated utility system. By conducting these modeling evaluations, NREL and Northern will be able to identify any unforeseen protection scheme or operational issues prior to developing the prototype. Following the prototype build, NREL will expand planned laboratory tests of the prototype to validate its performance and ensure that it meets national and state interconnection standards. This work is important to understand the electrical impacts of Distributed Energy Resources (DER) on the utility distribution system and the validation of interconnection standards and rules.

The second goal is for NREL to assist PIER in the development of a multi-year program for advanced power electronic interfaces for DER namely the "Advanced Power Electronics Interface (APEI) Initiative." Power electronic interface costs and reliability continue to be a critical path item to the long term cost effectiveness of many DER systems including PV, fuel cells, and micro-turbines. However, power electronics offer an elegant and flexible solution to integrating DER to the utility system due to their programmability, flexible functionality, and controllability enabling such things as power conditioning or providing utility system support of real or reactive power. Because of this flexible functionality, other DER technologies such as engines are looking to power electronics interfaces to enable better, more flexible integration with the utility system. NREL will assist PIER staff in identifying the status of power electronic technology and where public interest R&D opportunities may exist. Working with PIER staff, NREL will then develop a multi-year R&D plan that PIER staff will consider for follow-on projects funding through competitive solicitations administered by NREL. Staff is also actively collaborating with the Department of Energy (DOE) and hope that DOE will jointly fund this new initiative perhaps as soon as FY 05/06.

These activities support goals of the California Energy Action Plan, and the California Distributed Generation Strategic Plan, the PIER 5-Year Investment Plan, and the PIER DER Integration R&D Plan and Technology Roadmap. The goals of these various policy documents and research plans are to use DER technologies to enhance the cost effectiveness, reliability, power quality, security and environmental friendliness of the California and U.S. electric power system.

This project supports the PIER Program objectives of:

- Improving the energy cost/value of California's electricity by developing a universal and cheaper interconnection device.
- Improving the reliability/quality of the California's electricity by promoting new technologies to increase the use of DER to support the reliability of the grid.
- Improving the safety of California's electricity by developing advanced power electronics to controls DER and Grid interconnection.

Proposed Outcomes:

1. Develop processes, standards and technology for the purpose of integrating DER in the electrical distribution system.
2. Perform modeling and validation testing of NPS interconnect device operation in a simulated utility distribution feeder.
3. Develop a Program Plan for a multi-year initiative in Advanced Power Electronics Interface.

Project Status:

The project is active on schedule and on budget. This project will begin January 2005. The deliverable of this project will open the door to a multi-year project, namely the "Advanced Power Electronics Interface (APEI) Initiative."